

AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A computing device comprising:
a processor; and a
a compiler apparatus that for translating translates a source program into a machine
language program, said compiler apparatus comprising:
a directive acquisition unit operable to acquire a directive for optimizing a
machine language program to be generated; and
an optimization unit operable to perform optimization by generating a
sequence of machine language instructions following ~~an~~ the acquired directive,
wherein the optimization unit performs the optimization by deciding array data
allocated to a global memory region following a directive when the directive acquisition unit
acquires the directive on the array data to be allocated to the global memory region,
wherein the global memory region is specified by a head address and a
displacement,
wherein the head address is indicated by a value stored in a register,
wherein the displacement is within a range of the global memory region that
can be accessed by one instruction, and
wherein the range is determined based on a type and a size of an object.

2. (Currently Amended) The computing device ~~compiler apparatus~~ according to
Claim 1,
wherein the directive acquisition unit acquires designation of a maximum data size of
array data to be allocated to ~~[[a]]~~ the global memory region together with a directive for
translating the source program, and
the optimization unit ~~unit, out of array data declared by the source program,~~ allocates
array data whose maximum data size does not exceed the maximum data size to ~~[[a]]~~ the
global memory region and array data whose maximum data size exceeds the maximum data
size to a memory region out of the global memory region, based on array data declared by the
source program.

3. (Currently Amended) The computing device ~~compiler~~ apparatus according to Claim 1,

wherein the directive acquisition unit detects a directive for not allocating specific array data to the global memory region in the source program, and

the optimization unit allocates array data that ~~are~~ is an object of a directive detected by the directive acquisition unit to a memory region out of the global memory region.

4. (Currently Amended) The computing device ~~compiler~~ apparatus according to Claim 1,

wherein the directive acquisition unit detects a directive for allocating specific array data to the global memory region in the source program, and

the optimization unit allocates array data that ~~are~~ is an object of a directive detected by the directive acquisition unit to the global memory region.

5. (Currently Amended) A computer-readable recording medium on which a source program described in a high-level language is recorded,

wherein the source program includes at least one of descriptions for directing a compiler that translates the source program into a machine language program (1) not to allocate a specific array data to a global memory region and (2) to allocate the specific array data to the global memory region,

wherein the global memory region is specified by a head address and a displacement,

wherein the head address is indicated by a value stored in a register,

wherein the displacement is within a range of the global memory region that can be accessed by one instruction, and

wherein the range is determined based on a type and a size of an object.

6-7. (Canceled)

8. (Currently Amended) A computing device comprising:

a processor; and
a compiler apparatus for translating a source program into a machine language program,
said compiler apparatus comprising:
a directive acquisition unit operable to acquire a directive for optimizing a
machine language program to be generated; and
an optimization unit operable to perform optimization by generating a sequence of
machine language instructions following the acquired directive,
wherein the optimization unit performs optimization on software pipelining
following a directive when the directive acquisition unit acquires the directive on optimization by
software pipelining,
~~The compiler apparatus according to Claim 6,~~
wherein the directive acquisition unit detects a directive for not performing the
optimization by software pipelining of a specific loop processing in the source program, and
wherein the optimization unit restrains the optimization by software pipelining of
loop processing that is an object of the directive detected by the directive acquisition unit.

9. (Currently Amended) A computing device comprising:
a processor; and
a compiler apparatus for translating a source program into a machine language program,
said compiler apparatus comprising:
a directive acquisition unit operable to acquire a directive for optimizing a
machine language program to be generated; and
an optimization unit operable to perform optimization by generating a sequence of
machine language instructions following the acquired directive,
wherein the optimization unit performs optimization on software pipelining
following a directive when the directive acquisition unit acquires the directive on optimization by
software pipelining,
~~The compiler apparatus according to Claim 6,~~

wherein the directive acquisition unit detects a directive for performing the optimization by software pipelining that removes a prolog portion and an epilog portion of a specific loop processing in the source program, and

wherein the optimization unit performs the optimization by software pipelining of loop processing that is an object of the directive detected by the directive acquisition unit whenever possible to remove the prolog portion and the epilog portion.

10. (Currently Amended) A computing device comprising:

a processor; and

a compiler apparatus for translating a source program into a machine language program, said compiler apparatus comprising:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization on software pipelining following a directive when the directive acquisition unit acquires the directive on optimization by software pipelining,

~~The compiler apparatus according to Claim 6;~~

wherein the directive acquisition unit detects a directive for performing the optimization by software pipelining that does not remove the prolog portion and the epilog portion of a specific loop processing in the source program, and

wherein the optimization unit performs the optimization by software pipelining of loop processing that is an object of the directive detected by the directive acquisition unit whenever possible not to remove the prolog portion and the epilog portion.

11. (Currently Amended) A computing device comprising:

a processor; and

a compiler apparatus for translating a source program into a machine language program,
said compiler apparatus comprising:

a directive acquisition unit operable to acquire a directive for optimizing a
machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of
machine language instructions following the acquired directive,

wherein the optimization unit performs optimization on software pipelining
following a directive when the directive acquisition unit acquires the directive on optimization by
software pipelining,

~~The compiler apparatus according to claim 6,~~

wherein the directive acquisition unit detects a designation of the number of
iterations of specific loop processing in the source program, and

wherein the optimization unit performs optimization of loop processing that is an
object of the designation detected by the directive acquisition unit based on the designated
number of iterations.

12. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim
11,

wherein the designation of the number of the iterations is the minimum number by which
the loop processing is iterated, and the optimization unit performs the optimization by software
pipelining when the minimum number is equivalent to or larger than the number of iterations that
overlap by software pipelining.

13. (Original) A computer-readable recording medium on which a source program
described in a high-level language is recorded,

wherein the source program includes at least one of descriptions for directing a compiler
that translates the source program into a machine language program (1) not to perform the
optimization by software pipelining of a specific loop processing, (2) to perform optimization
that removes a prolog portion and an epilog portion by software pipelining of the specific loop

processing, and (3) to perform optimization that does not remove the prolog portion and the epilog portion by software pipelining of the specific loop processing.

14-15. (Canceled)

16. (Currently Amended) A computing device comprising:

a processor; and

a compiler apparatus for translating a source program into a machine language program, said compiler comprising:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization by loop unrolling following a directive when the directive acquisition unit acquires the directive on the optimization by loop unrolling,

~~The compiler apparatus according to claim 14,~~

wherein the directive acquisition unit detects a directive for performing the optimization by loop unrolling of a specific loop processing in the source program, and

wherein the optimization unit performs the optimization by loop unrolling of loop processing that is an object of the directive detected by the directive acquisition unit.

17. (Currently Amended) A computing device comprising:

a processor; and

a compiler apparatus for translating a source program into a machine language program, said compiler comprising:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of

machine language instructions following the acquired directive,

wherein the optimization unit performs optimization by loop unrolling following a directive when the directive acquisition unit acquires the directive on the optimization by loop unrolling,

~~The compiler apparatus according to claim 14,~~

wherein the directive acquisition unit detects a directive for not performing the optimization by loop unrolling of a specific loop processing in the source program, and

wherein the optimization unit restrains the optimization by loop unrolling of loop processing that is an object of the directive detected by the directive acquisition unit.

18. (Currently Amended) A computing device comprising:

a processor; and

a compiler apparatus for translating a source program into a machine language program, said compiler comprising:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization by loop unrolling following a directive when the directive acquisition unit acquires the directive on the optimization by loop unrolling,

~~The compiler apparatus according to claim 14,~~

wherein the directive acquisition unit detects a designation of the number of iterations of specific loop processing in the source program, and

wherein the optimization unit performs optimization of loop processing that is an object of the designation detected by the directive acquisition unit based on the designated number of iterations.

19. (Currently Amended) ~~The computing device compiler apparatus according to claim~~

18,

wherein the designation of the number of the iterations is the minimum number by which the loop processing is iterated, and the optimization unit restrains generation of an escape code that is needed in the case of the number of the iterations being 0 when the minimum number is 1 or more.

20. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 18,

wherein the designation of the number of the iterations is the minimum number by which the loop processing is iterated, and the optimization unit performs the optimization by loop unrolling when the minimum number is equivalent to or more than the number of development by the loop unrolling.

21. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 18,

wherein the designation of the number of the iterations guarantees that the loop processing is iterated only an even number of times, and the optimization unit performs the optimization by loop unrolling assuming that the loop processing that is an object of designation detected by the directive acquisition unit is iterated only the even number of times.

22. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 18,

wherein the designation of the number of the iterations guarantees that the loop processing is iterated only an odd number of times, and the optimization unit performs the optimization by loop unrolling assuming that the loop processing that is an object of designation detected by the directive acquisition unit is iterated only the odd number of times.

23. (Original) A computer-readable recording medium on which a source program described in a high-level language is recorded,

wherein the source program includes at least one of descriptions for directing a compiler that translates the source program into a machine language program (1) to perform the optimization by loop unrolling of a specific loop processing, (2) not to perform the optimization by loop unrolling of a specific loop processing, and (3) to require a guarantee on the number of iterations of a specific loop processing.

24. (Currently Amended) A computing device comprising:
a processor; and
a compiler apparatus for that translates translating a source program into a machine language program, said compiler apparatus comprising:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization on an "if" conversion following a directive when the directive acquisition unit acquires the directive on the "if" conversion, and

wherein the "if" conversion is rewriting an if construction in the source program to a conditional instruction without using a branch instruction.

25. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 24,

wherein the directive acquisition unit acquires a directive for not making an "if" conversion together with a directive for translating the source program, and the optimization unit restrains the "if" conversion of all "if" structure sentences in the source program when the directive acquisition unit acquires the directive for not making the "if" conversion.

26. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 24,

wherein the directive acquisition unit detects a directive for making an "if" conversion of a specific "if" structure sentence in the source program, and the optimization unit makes the "if" conversion of the "if" structure sentence that is an object of the directive detected by the directive acquisition unit.

27. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 24,

wherein the directive acquisition unit detects a directive for not making an "if" conversion of a specific "if" structure sentence in the source program, and the optimization unit restrains the "if" conversion of the "if" structure sentence that is an object of the directive detected by the directive acquisition unit.

28. (Currently Amended) A computer-readable recording medium on which a source program described in a high-level language is recorded,

wherein the source program includes at least one of descriptions for directing a compiler that translates the source program into a machine language program (1) to make an "if" conversion to a specific "if" structure sentence and (2) not to make the "if" conversion to the specific "if" structure sentence, and

wherein the "if" conversion is rewriting an if construction in the source program to a conditional instruction without using a branch instruction.

29. (Canceled)

30. (Currently Amended) A computing device comprising:
a processor; and
a compiler apparatus for translating a source program into a machine language program,
said compiler apparatus comprising:
a directive acquisition unit operable to acquire a directive for optimizing a
machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization by allocating data in a memory region following a directive when the optimization unit acquires the directive on alignment of the array data to be allocated in a memory region,

~~The compiler apparatus according to claim 29,~~

wherein the directive acquisition unit acquires a directive for alignment of array data of a ~~special~~ specific type together with a directive for translating the source program, and

wherein the optimization unit allocates all the array data of the ~~special~~ specific type declared in the source program in the memory region so that its head address matches the alignment.

31. (Canceled)

32. (Currently Amended)) A computing device comprising:

a processor; and

a compiler apparatus for translating a source program into a machine language program, said compiler apparatus comprising:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization by allocating data in a memory region following a directive when the optimization unit acquires the directive on alignment of the array data to be allocated in a memory region, and

~~The compiler apparatus according to claim 29,~~

wherein the directive acquisition unit detects a designation of alignment of data that a pointer variable of argument shown by the name of a specific variable indicates in the source program, and

wherein the optimization unit performs the optimization assuming that the data that is an object of designation detected by the directive acquisition unit is allocated in the memory region by the designated alignment.

33. (Currently Amended)) A computing device comprising:

a processor; and

a compiler apparatus for translating a source program into a machine language program,
said compiler apparatus comprising:

a directive acquisition unit operable to acquire a directive for optimizing a
machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of
machine language instructions following the acquired directive,

wherein the optimization unit performs optimization by allocating data in a
memory region following a directive when the optimization unit acquires the directive on
alignment of the array data to be allocated in a memory region, and

~~The compiler apparatus according to claim 29,~~

wherein the directive acquisition unit detects a designation of alignment of data that a local pointer variable shown by the name of a specific variable indicates in the source program, and

wherein the optimization unit performs the optimization assuming that the data that is an object of designation detected by the directive acquisition unit is allocated in the memory region by the designated alignment.

34. (Canceled)

35. (Previously Presented) A computer-readable recording medium on which a source program described in a high-level language is recorded, wherein the source program includes at least one of descriptions for directing a compiler that translates the source program into a machine language program (1) to require a guarantee on alignment of data that a pointer variable

of argument shown by the name of a specific variable indicates and (2) to require a guarantee on alignment of data that a local pointer variable shown by the name of a specific variable indicates.

36. (Currently Amended) A computer readable medium having a program stored thereon, the program being for a compiler apparatus that translates a source program into a machine language program, the program causing a computer to function as:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following ~~an~~ the acquired directive,

wherein the optimization unit performs the optimization by deciding array data allocated to a global memory region following a directive when the directive acquisition unit acquires the directive on the array data to be allocated to the global memory region,

wherein the global memory region is specified by a head address and a displacement,

wherein the head address is indicated by a valued stored in a register,

wherein the displacement is within a range of the global memory region that can be accessed by one instruction, and

wherein the range is determined based on a type and a size of an object.

37. (Currently Amended) A computer readable medium having a program stored thereon, the program being for a compiler apparatus that translates a source program into a machine language program, the program causing a computer to function as:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following an acquired directive,

wherein the optimization unit performs optimization on software pipelining following a directive when the directive acquisition unit acquires the directive on optimization by software pipelining.

38. (Currently Amended) A computer readable medium having a program stored thereon, the program being for a compiler apparatus that translates a source program into a machine language program, the program causing a computer to function as:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following an acquired directive,

wherein the optimization unit performs optimization by loop unrolling following a directive when the directive acquisition unit acquires the directive on the optimization by loop unrolling.

39. (Currently Amended) A computer readable medium having a program stored thereon, the program being for a compiler apparatus that translates a source program into a machine language program, the program causing a computer to function as:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization on an "if" conversion following a directive when the directive acquisition unit acquires the directive on the "if" conversion.

40. (Currently Amended) A computer readable medium having a program stored thereon, the program being for a compiler apparatus that translates a source program into a machine language program, the program causing a computer to function as:

a directive acquisition unit operable to acquire a directive for optimizing a machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of machine language instructions following the acquired directive,

wherein the optimization unit performs optimization by allocating data in a memory

region following a directive when the optimization unit acquires the directive on alignment of the array data to be allocated in a memory region.

41. (Canceled)

42. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 32,

wherein the optimization unit generates a pair instruction for transferring two or more kinds of data at the same time regarding a memory access instruction for accessing the data to be allocated in the memory region.

43. (Currently Amended) The computing device ~~compiler apparatus~~ according to claim 33,

wherein the optimization unit generates a pair instruction for transferring two or more kinds of data at the same time regarding a memory access instruction for accessing the data to be allocated in the memory region.

44. (New) The computing device according to claim 16, wherein the loop processing that is an object directive detected by the directive acquisition unit is a loop processing that appears first after the directive for performing the optimization by loop unrolling in the source program.

45. (New) The computing device according to claim 17, wherein the loop processing that is an object directive detected by the directive acquisition unit is a loop processing that appears first after the directive for not performing the optimization by loop unrolling in the source program.

46. (New) A computing device comprising:
a processor; and

a compiler apparatus for translating a source program into a machine language program,
said compiler apparatus comprising:

a directive acquisition unit operable to acquire a directive for optimizing a
machine language program to be generated; and

an optimization unit operable to perform optimization by generating a sequence of
machine language instructions following the acquired directive,

wherein the directive acquisition unit detects a designation of the number of
iterations of specific loop processing in the source program, and

wherein the optimization unit performs optimization of loop processing that is an
object of the designation detected by the directive acquisition unit based on the designated
number of iterations.

47. (New) The computing device according to claim 46,

wherein the designation of the number of the iterations is the minimum number by which
the loop processing is iterated, and the optimization unit performs the optimization by software
pipelining when the minimum number is equivalent to or larger than the number of iterations that
overlap by software pipelining.

48. (New) The computing device according to claim 46,

wherein the designation of the number of the iterations is the minimum number by which
the loop processing is iterated, and the optimization unit restrains generation of an escape code
that is needed in the case of the number of the iterations being 0 when the minimum number is 1
or more.

49. (New) The computing device according to claim 46,

wherein the designation of the number of the iterations is the minimum number by which
the loop processing is iterated, and the optimization unit performs the optimization by loop
unrolling when the minimum number is equivalent to or more than the number of development
by the loop unrolling.

50. (New) The computing device according to claim 46,
wherein the designation of the number of the iterations guarantees that the loop processing is iterated only an even number of times, and the optimization unit performs the optimization by loop unrolling assuming that the loop processing that is an object of designation detected by the directive acquisition unit is iterated only the even number of times.

51. (New) The computing device according to claim 46,
wherein the designation of the number of the iterations guarantees that the loop processing is iterated only an odd number of times, and the optimization unit performs the optimization by loop unrolling assuming that the loop processing that is an object of designation detected by the directive acquisition unit is iterated only the odd number of times.

52. (New) The computing device according to claim 8, wherein the loop processing that is an object directive detected by the directive acquisition unit is a loop processing appears first after the directive for not performing the optimization by software pipelining in the source program.

53. (New) The computing device according to claim 9, wherein the loop processing that is an object directive detected by the directive acquisition unit is a loop processing appears first after the directive for performing the optimization by software pipelining in the source program.

54. (New) The computing device according to claim 10, wherein the loop processing that is an object directive detected by the directive acquisition unit is a loop processing appears first after the directive for performing the optimization by software pipelining in the source program.